Contribution ID: **2** Type: **Invited speakers**

How SANS reveals the nanostructure and moisture interactions of wood cell walls

Monday, 26 September 2022 11:40 (25 minutes)

Wood is an abundant biological material with various technical applications ranging from sustainable building materials to advanced functional materials made of nanocelluloses. The structure of wood cell walls is hierarchical, consisting of well-oriented, elongated units from the molecular level to the macroscale. Our picture of the complex composite-like structure of wood cell walls and its interactions with water has become more accurate during the past decade, and results obtained with small-angle neutron scattering (SANS) have played an important part in this development.

SANS can be used to observe the structure of wood cell walls from the level of cellulose microfibrils (diameter 2-3 nm) to microfibril bundles (diameter 10-20 nm) and above. It detects the moisture-induced swelling of the microfibril bundles, which can be analysed using the WoodSAS model [1]. This model allows also determining the diameter of microfibril bundles in the wet state, without cutting the cell walls [2]. We have subsequently used SANS for *in situ* experiments investigating the drying behavior of wood [3] and the exchange of liquid water within the fibrillar structures [4]. All of these studies were based on SANS experiments carried out at D11.

References

[1] Penttilä, P.A., Rautkari, L., Österberg, M., Schweins, R. (2019) *J. Appl. Crystallogr.*, 10.1107/S1600576719002012
[2] Penttilä, P.A., Altgen, M., Awais, M., Österberg, M., Rautkari, L., Schweins, R. (2020) *Sci. Rep.*, 10.1038/s41598-020-77755-y
[3] Zitting, A., Paajanen, A., Rautkari, L., Penttilä, P.A. (2021) *Cellulose*, 10.1007/s10570-021-04204-y
[4] Penttilä, P.A., Zitting, A., Lourençon, T., Altgen, M., Schweins, R., Rautkari, L. (2021) *Cellulose*, 10.1007/s10570-021-04253-3

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Session Classification: Talks